PREFACE

This first edition of the *National ITS Program Plan* was a joint effort of ITS America and the United States Department of Transportation. The plan was developed through a consensus building process which sought the involvement of the entire ITS community. Over 36 individuals participated actively as authors, and well over 200 individuals from a wide range of organizations critiqued, commented, and otherwise contributed substantially to the material presented here.

The *National ITS Program Plan* consists of two volumes. An Executive Summary and a Synopsis are also available. The Executive Summary provides a very brief overview of the goals, objectives, and recommendations presented in the *National ITS Program Plan*. The Synopsis provides a 50 page encapsulation of the major subject areas within the document, with special emphasis on the area of deployment. Volume I focuses on the goals of ITS, compatibility, deployment, and program assessment. Volume II contains detailed descriptions and plans for each of the 29 user services.

Work on the *National ITS Program Plan* formally commenced in June,1993. The Second and Final Drafts of the Plan, completed in May 1994 and November 1994 respectively, incorporated the comments and contributions of a substantial number of individuals and organizations. In total, more than 4,000 draft copies of the plan were distributed to ITS America members, U.S. DOT staff, and the general public through the Federal Register. Over 200 individuals and organizations commented and provided input for one or more of the drafts.

The process of developing the *National ITS Program Plan* was, in itself, a valuable exercise. The focus of the first draft was upon the creation of the user service development plans now contained in Volume II. The remainder of the draft consisted largely of annotated outlines. A Joint Writing Team (JWT) was formed and given the responsibility of developing the Plan. In the second draft, the deployment and deployment considerations chapters took shape, and with the third draft, deployment scenarios emerged. Each draft represented significant advances in our deliberations on ITS technology, systems, deployments, and impacts.

Overall guidance to the JWT on the Plan was provided by U.S. DOT officials and the ITS America Planning Committee. The Joint Writing Team, co-chaired by Doug Robertson (ITS America) and Gary Euler (US DOT ITS Joint Program Office), consisted of ITS America and US DOT staff and ITS America members. The JWT members, acknowledged by name and organization below, worked extensively with ITS America members, U.S. DOT staff, and the general public with a goal of ensuring balanced representation of the goals, objectives, concerns, and needs of a diverse ITS Community.

The field of ITS is advancing rapidly on many fronts; keeping abreast of it will require a continuing effort. This document will serve as the basis for periodic updates, providing information on activities, as well as projections for the future.

I. INTRODUCTION

Surface transportation in the United States faces a number of challenges. Despite the fact that the United States has one of the best surface transportation systems in the world, mobility is declining and safety remains a serious problem. Inefficient movement of vehicles reduces productivity, wastes energy, increases emissions, and threatens the quality of life we enjoy. The continued development and maintenance of a safe, efficient, environmentally responsible transportation system is vital to the social and economic health of the nation.

Intelligent Transportation Systems (ITS) apply advanced and emerging technologies in information processing, communications, control, and electronics to meet surface transportation needs. ITS, formerly called Intelligent Vehicle-Highway Systems (IVHS), provide a means to address current problems, as well as anticipate and address future demand through an intermodal, strategic approach to transportation. While ITS technology alone cannot solve our transportation problems, it can enable us to re-think our approach to problem solutions, as well as to make current activities more efficient.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA)

The Intelligent Vehicle Highway Systems Act within the Intermodal Surface Transportation Efficiency Act (ISTEA) established the IVHS (now ITS) program in the United States and called for the development of the US DOT Strategic Plan for IVHS. The purpose was to provide a new vision of surface transportation in America.

The Act was structured to address a number of the societal challenges involved in providing accessible transportation, including the goals of:

- enhancing the capacity, efficiency, and safety of the highway system, including alternatives to additional physical capacity;
- enhancing efforts to attain air quality goals established by the Clean Air Act;
- reducing societal, economic, and environmental costs associated with traffic congestion;
- developing and promoting an ITS industry in the United States, particularly creating an American presence in this emerging field of technology; and
- developing a technology base for ITS systems.

Goals and Objectives

The national ITS program goals and objectives evolved as the program developed. The program goals set out in ISTEA provided the basic framework, and were expanded in both ITS America's *Strategic Plan for Intelligent Vehicle-Highway Systems* and the US DOT's *IVHS Strategic Plan*. The goals are to:

- Improve the safety of the nation's surface transportation system;
- Increase the operational efficiency and capacity of the surface transportation system;
- Reduce energy and environmental costs associated with traffic congestion;

- Enhance present and future productivity;
- Enhance the personal mobility and the convenience and comfort of the surface transportation system; and
- Create an environment in which the development and deployment of ITS can flourish.

Potentially, the most effective approaches to developing a more efficient, safe, environmentally conscious transportation system are those which address the fundamental goal of transportation as one of "moving passengers and goods" through a system by the most efficient, effective means possible. This requires that transportation policy makers, service providers, planners, and users develop a "systems approach" to transportation. The system is viewed as an integrated transportation network where users have the choice of a number of modes, routes, and travel times, and may move easily through the system. Achieving more integrated transportation systems requires institutional, legal, and technical innovation. In some instances, the technological capabilities provided by ITS can facilitate institutional changes which remove barriers to the development of integrated systems.

II. THE PLAN

The Strategic Plans for IVHS developed by ITS America and the US DOT articulated the need to develop a framework for the deployment of ITS. This framework would provide a common conceptual language for discussing ITS, address the potential roles of various levels of government, and identify and address the impacts of ITS and the potential barriers to the development of beneficial services. The specific goals of the National ITS Program Plan (NPP) are to:

- Promote shared ITS goals, providing integrated descriptions of activities that are public, private, and cooperative;

- Guide ITS investment decisions, laying a foundation for the private and public sectors, and service consumers;

- Encourage coordination by providing a framework for planning;

- Focus on deployment by reflecting on the key forces affecting deployment decisions, and the order in which user services can and likely will be deployed;

- Facilitate the development of an intermodal, integrated national transportation system by presenting visions of ITS deployment which facilitate intermodal linkages for passengers and freight.

The NPP is the result of a joint effort of the US DOT and ITS America. Authors and editors were drawn from ITS America members and staff, and US DOT staff. In total, more than 35 individuals contributed substantial text and editorial assistance in the formation of this plan. Another 200 reviewed one or more drafts of the document. The contributors to the plan included representatives from local, state, and federal government; universities and research organizations; other societies and public interest groups; and the private sector. Private sector

participants represented manufacturers, transportation service providers, communications companies, and transportation consultants. In short, this diverse group represented most of the ITS community.

The NPP is structured around the concept of "User Services." These User Services are, in essence, products and services that may be developed to meet the needs of users. In this context, the term "user" refers to a wide range of individuals and organizations including travelers, service providers, and transportation policy makers.

The 29 user services are shown in Table 1. Some of these are oriented toward meeting the needs of individual travelers, others focus on efforts to provide efficient, cost effective transportation services under a wide range of circumstances. These services do not cover every possible application of ITS, rather they are intended as steps toward the development of a common framework for discussion. The list of services and their definitions are expected to evolve over time. New services may be added and existing service descriptions may change.

III. THE DEPLOYMENT OF ITS

The deployment of ITS will be distinctly different from the centralized, staged development of major national systems in the aviation, defense, and space programs. One reason for this is the extremely diverse set of players involved in the development, planning, deployment and operation of transportation infrastructure and services. Some ITS products will be developed and deployed wholly within the private sector, as consumer products. Other ITS deployment and operations will unfold through partnerships involving federal, state, and local governments, and the private sector. Others may be primarily public sector activities.

Where is ITS Today?

ITS should not be regarded as futuristic or even the technology of tomorrow. ITS is here and now. Traffic surveillance systems are increasingly visible on the roadway. Commercial vehicles and transit operators routinely use vehicle location systems and on-board computers to manage their fleets. Electronic toll collection systems are springing up around the country, and in-vehicle route guidance systems are available to consumers. Table 2 presents a "snapshot" of current deployment in the United States.

How Will ITS Be Deployed in the Future?

As shown above, there are a number of ITS services emerging in the market place. A number of others are "on-the-shelf" and could be deployed under the proper circumstances. ITS could evolve over the next 10 years in a number of possible ways. Future deployment of ITS can be characterized as a three-stage process:

1997-1999: The Era of Travel Information and Fleet Management
2000-2005: The Era of Transportation Management
2010: The Era of the Enhanced Vehicle.

Table 1- User Service Bundles

Bundle	User Services
1. Travel and Transportation Management	1. En-Route Driver Information 2. Route Guidance 3. Traveler Services Information 4. Traffic Control 5. Incident Management 6. Emissions Testing and Mitigation
2. Travel Demand Management	1. Demand Management and Operations 2. Pre-Trip Travel Information 3. Ride Matching and Reservation
3. Public Transportation Operations	1. Public Transportation Management 2. En-Route Transit Information 3. Personalized Public Transit 4. Public Travel Security
4. Electronic Payment	1. Electronic Payment Services
5. Commercial Vehicle Operations	1. Commercial Vehicle Electronic Clearance 2. Automated Roadside Safety Inspection 3. On-board Safety Monitoring 4. Commercial Vehicle Administrative Processes 5. Hazardous Materials Incident Response 6. Freight Mobility
6. Emergency Management	1. Emergency Notification and Personal Security 2. Emergency Vehicle Management
7. Advanced Vehicle Control and Safety Systems	1. Longitudinal Collision Avoidance 2. Lateral Collision Avoidance 3. Intersection Collision Avoidance 4. Vision Enhancement for Crash Avoidance 5. Safety Readiness 6. Pre-Crash Restraint Deployment 7. Automated Highway System

Table 2: A Snapshot of Current Deployment

Travel and Transportation Management

Many metropolitan and state transportation agencies employ some form of advanced transportation management system. Loop detectors, video cameras, and vehicle identification devices such as toll tags can be used to monitor current traffic conditions. Active control of traffic is achieved through use of signal timing, ramp meters, variable message signs, highway advisory radio, and commercial traffic information reporting services. Adaptive, real time traffic control systems are now available, but most signal timing adjustments are still made by time of day or other pre-established patterns.

Private sector companies collect travel information from a variety of sources; then package and sell the information. Radio and television broadcasts provide travelers with information that may allow them to make better travel choices. Personal devices (such as digital cellular telephone and paging systems, portable digital personal communications devices, in-vehicle subcarrier radio, and palm top computers) can be used to receive travel information; however, widespread implementation is hampered by uncertainty about marketability and a lack of specific, localized traveler information.

Static route guidance systems are commercially available to consumers as in-vehicle devices, in rental cars, and as personal computer software packages. Dynamic route guidance systems cannot be widely implemented until more real-time travel data is available and greater consistency can be achieved among jurisdictions.

Commercial Vehicle Operations

Commercial fleet management systems have been deployed in over half the major US trucking fleets. Private truck and bus companies incorporate safety data from on-board devices, such as engine temperature and driver hours, in their routing and dispatching decisions. Automatic vehicle and container identification systems are expediting just-in-time deliveries and intermodal shipping operations.

Motor Carrier Management Information System (MCMIS) is a federal database of motor carrier safety information used by states in roadside inspections. Automatic vehicle identification and weigh-in-motion technologies are used to gather information on truck credentials and vehicle weight. Heavy Vehicle Electronic License Plate, Inc. (HELP, Inc.) and the Advantage I-75 operational test will soon use electronic clearance services to permit safe and legal trucks equipped with transponders to bypass weigh stations and state ports-of-entry at highway speeds.

Some states are use pen-based data input devices to quickly upload inspection data electronically, reducing the total time for routine roadside safety inspections of trucks and buses. Vehicle inspections still are conducted manually. Advanced inspection procedures are under development.

Advanced Vehicle Control and Safety Systems

A few longitudinal and lateral collision warning systems are available on the market. All of the major automobile manufacturers are working on intelligent cruise control systems. These systems are expected to be available within 3 to 5 years, perhaps in conjunction with rear end collision avoidance systems to reduce liability risks.

Public Transportation Operations

Most large- and medium-sized transit agencies use scheduling and run-cutting software. Computer-aided dispatch transit radio systems and automatic vehicle location systems are becoming more commonplace among agencies. Fourteen transit properties currently have automated vehicle location capability. Location information is provided by GPS, signposts, or map matching applications.

Demand responsive trip scheduling software is in widespread use in specialized transportation systems for older and disabled travelers. Some small systems use route deviation schemes. Advanced transit security devices, such as closed circuit TV in parking lots and stations, slow-scan recording cameras in vehicles, and emergency alarms in vehicle radios, are in use.

Emergency Management

Nationwide, 24 emergency management systems are now equipped with automatic vehicle location (AVL) systems, 104 others are planning to implement AVL. Enhanced 9-1-1 deployment is bringing emergency services to accident scenes more quickly and efficiently. Through automatic phone number and location identification, emergency service vehicles are assigned to respond and are quickly routed to the proper location.

Electronic Payment

Several public transit systems now use magnetic stripe technology to collect fares. Some systems are evaluating the use of "smart cards" for multiple transportation and non-transportation purposes, such as parking fees and telephone usage. Electronic payment systems are planned or deployed at 20 toll facilities around the country, and a robust, competitive market has developed for these systems. In some regions efforts are underway to install compatible systems in adjacent states, but broad interoperability has not yet been achieved. Standards development to address interoperability is making headway, however.

Table 3 provides descriptions of the systems that may be deployed in each of these eras. The final form of ITS deployment will be influenced by a confluence of factors and the cumulative impact of decisions made by a number of diverse players. Private sector activities in ITS depend heavily on their confidence in the market for ITS and their ability to develop a revenue stream. Because state and local governments are directly responsible for construction, operation, and maintenance of the transportation systems in their jurisdictions, they have a major role in how ITS deployment will take shape. The US DOT has an important role in supporting the deployment of ITS through research, development, testing, and support for early deployment planning.

IV. SUPPORTING ITS DEPLOYMENT

ITS deployment is under way. The NPP identifies a number of broad challenges that will sustain and in some cases, accelerate the development and deployment of ITS. These include the problems of national compatibility and a series of near- and long-term institutional challenges.

National Interoperability

National compatibility and interoperability is not likely to emerge from a random, evolutionary process. It must be fostered through cooperation. The development of the National ITS Architecture and on-going work in the development of standards are essential components of this effort.

The National ITS Architecture will provide a framework that describes how ITS components interact and work together to achieve total system goals. Many different designs might be implemented within the framework of an architecture. An open system architecture will describe the system operation and the information exchanged among the components. The architecture will also be modular, which will facilitate the introduction of new technologies and system capabilities. Phase I, completed in January 1995, produced four architectures. Two teams, led by Loral Federal Systems and Rockwell were selected to implement Phase II. They are working together in a non-competitive environment to refine the Phase I architectures into a single national ITS architecture. This phase began in February 1995 and is scheduled for completion in July 1996. Each step in the process has included a broad consensus effort as an intregal part of the architecture development.

Establishment of ITS standards will also accelerate ITS development and deployment in several ways. Appropriate standards will facilitate national, global, and cross-modal compatibility and interoperability and help U.S. industries gain greater access to the international ITS marketplace by ensuring that ITS components will operate in a consistent, predictable way. Standards development will improve overall product design and performance, safety, and ease of operation and maintenance. The emergence of industry

Table 3: Future Deployment Scenarios

1997-1999: THE ERA OF TRAVEL INFORMATION AND FLEET MANAGEMENT

Private companies and public agencies at all levels, and for all modes collect travel data; however, no one has a broad enough information network to support real-time, detailed travel decision making. A crucial ITS objective in the next three to five years is to build the relationships among public agencies and private companies necessary to share data from all modes of surface transportation and provide that data to the public in a timely and effective way. The development of rich, shared travel information bases could provide the foundation on which states and metropolitan areas could support and integrate many ITS traffic, transit, safety, and commercial vehicle services. Over time, data bases will be expanded to provide more detailed and comprehensive transportation information.

Data sharing for commercial vehicle operations will accelerate as well. State databases, linked to exchange regulatory and safety information, will boost the use of advanced technologies to verify credentials and monitor fleet safety performance. Automated vehicle identification and weigh-in-motion systems will be operational on most major trucking corridors and international border crossings. Navigation systems using GPS and satellite communications will become common in truck and bus fleets, enhancing the efficiency of freight distribution and fleet management systems.

Electronic toll collection systems will be deployed at an accelerated pace as their convenience is recognized by the general public and toll authorities begin to achieve cost savings.

By reaching this interim ITS deployment scenario, the stage will be set for achieving longer term transportation management objectives and establishing U.S. industries as strong players in the global market for ITS technologies and services. The completion of the national ITS architecture and the emergence of more public infrastructure will provide private sector companies with greater confidence about entering the ITS market and supporting the communications required by transportation management systems.

The technologies will be available to implement congestion pricing if local policy dictates. Revenues from congestion pricing applications and privatization activities might be seen as an appropriate resource for ITS operations and maintenance funding.

Automobile manufacturers will offer a variety of in-vehicle products, such as intelligent cruise control. Autonomous route guidance systems will be readily available to consumers, and as travel information bases mature, dynamic route guidance will become possible in some parts of the country. Mayday safety and security services will be deployed in both rural and urban areas.

2000-2005: THE ERA OF TRANSPORTATION MANAGEMENT

By the turn of the century the vision of the "smart traveler" can indeed become a reality. With the institutional mechanisms and transportation infrastructure in place to provide a steady stream of reliable travel information, effective personal and public transportation management can take place. State and local agencies will have established the alliances with the private sector for the travel information dissemination methods that work best in their own areas. More capable roadside-to-vehicle communications infrastructure will be deployed to provide richer data and real-time, adaptive traffic control over large areas will become a realistic goal.

Jurisdictions will cooperate to support real-time sharing of information and transportation management strategies by traffic, freeway, transit, and emergency services control centers. Integration and adaptive control of freeways and surface streets will improve the flow of traffic, give preference to public safety, transit, and other high occupancy vehicles, and minimize congestion. The public and private sectors will cooperate to share the up-to-the-minute information needed to support real-time, dynamic route guidance systems for private and commercial vehicles.

Universal electronic payment systems will be available for tolls, transit fares, parking, and other financial transactions. Communities wishing to implement congestion pricing strategies will have a ready infrastructure and may see this as a source for operations and maintenance support.

By the year 2000, electronic clearance for commercial vehicles may be operational nationwide. An integrated network and database of electronic clearance and safety information will be available to support North American uniformity and productivity for the nation's commercial fleets. Hazardous materials incident notification services will provide early, accurate information for emergency respondors in some segments of the motor carrier industry.

In this second wave of deployment, application of aerospace and defense technologies will provide dramatic advances to automotive systems to improve traveler safety and provide real-time navigation assistance. Enhanced vehicle control systems, such as lateral warning and early collision avoidance features, will be marketed in private vehicles. Deployment of vehicle-to-vehicle communications systems may make preliminary intersection collision avoidance systems possible.

2010: THE ERA OF THE ENHANCED VEHICLE

By the year 2010, research and testing will have brought ITS to a stage of reliability and accuracy that will support introduction of more sophisticated vehicle safety and control services, such as in-vehicle signing and more advanced collision avoidance systems. These advanced systems will include lateral and longitudinal space control, vision enhancement systems, and assisted braking and steering. The data collection, sharing, and dissemination systems established in preceding years will provide a foundation for the early stages of deployment of automated highway systems.

standards will also boost consumer confidence, because new ITS products would be more likely to retain their value. Costs for manufacturers could be reduced by mitigating the risk that new products would depend upon "orphan" technologies. Although standard setting activities are underway, the adoption of the National ITS Architecture in 1996 will provide the framework for establishing many new ITS standards.

Near-term Institutional Challenges

The NPP identifies a number of important challenges which must be addressed and, if possible, resolved. The challenges which impact those ITS services already in the deployment phase and those which could be deployed in a three to five year time frame, are described below.

- *Lack of Market Information* - Before committing resources to marketing and deploying ITS services, many stakeholders feel they need a better understanding of the potential market for ITS. Public agencies want to know if ITS will influence traveler behavior and whether ITS might help generate revenue. Private companies need to determine the market risk involved in ITS investments and how soon investments can be recouped.

- *Uncertain public infrastructure base* - Although most ITS stakeholders believe a public ITS infrastructure will eventually be in place, they are uncertain about its nature and extent. Private companies do not want to rush to build private infrastructure, such as transportation data collection infrastructure, if public platforms will soon emerge. They also want greater assurance that their products and services will be compatible with the technologies that will ultimately dominate the public infrastructure.

- *Competition for scarce resources* - Current demands for transportation funding outstrip resources at all levels of government. Public ITS deployment investments compete with traditional projects such as highway resurfacing and reconstruction, transit fleet replacement, and other types of important capital improvements. Proposed ITS deployments must demonstrate that they will deliver significant travel efficiencies and other public benefits to win funding commitments for initial deployment as well as continuing operation and maintenance expenses.

- *Need for new skills* - Public agencies may not have the technical and engineering skills that are needed to manage the application of electronics and communications technologies to transportation services. Agencies must seek employees with appropriate technical training, provide updated training for current personnel, or use private sector technical expertise to substitute for or augment public agency skills.

- *Inexperience in partnerships* - ITS will cross city, state, and even international boundaries, and will link services which have traditionally been delivered by separate public agencies. Successful ITS deployment will depend upon the formation of new partnerships among different levels of government, across geographical lines, and even among agencies within jurisdictions. Possibly the most significant partnerships to be established in the near term are those between the public and private sectors to distribute

travel information. Reluctance to enter into new public/private partnerships is often founded on uncertainty about governmental policies, particularly those related to commercialization of traffic information and services, willingness to grant sufficient franchise rights to balance market risk, and long-term commitment.

- *Potential Loss of Privacy* - To the extent ITS services identify a specific traveler or vehicle, substantial privacy concerns are raised which could ultimately affect public acceptance of ITS. Because ITS is still in the initial stages of deployment, the ITS community can formulate and apply principles and safeguards to address privacy. Extensive consideration must be given to the circumstances under which travelers or vehicles need to be identified, how identifying information will be stored and used, who will have access to the information, and which secondary uses of the information will be permitted.

Longer-Term Institutional Challenges

- *Implications of ITS Deployment for Society*- ITS will provide many benefits for society, but attention must also be given to the effect ITS will have upon land use and communities. Care must be taken to ensure that the benefits and costs of ITS are fairly distributed. ITS services must not be available only to those who can afford high-end consumer products but must be accessible across a broad range of social, economic, and geographic groupings.

- *Concern for the Environment*- As ITS deployment matures, environmental issues must be addressed on a comprehensive basis. For example, it will be necessary to clarify appropriate processes for environmental review under the National Environmental Protection Act and the Clean Air Act Amendments. Also to refine assessments of ITS environmental impacts and promote involvement of the environmental community in project level ITS deployment decisions.

- *Improving Procurement of ITS* - Procurement issues will require substantial attention as deployment progresses and could require some degree of federal, state, or local legislative change. ITS procurements involve new, complex technologies, new partners, and multiple levels of legal requirements. There are an unusually large number and variety of public agencies involved in ITS procurements. Some specific procurement issues encountered in ITS deployment include requirements pertaining to competitive bidding, organizational conflicts of interest, bonding, treatment of intellectual property, and cost accounting and audit, as well as project uncertainties resulting from the procurement process.

- *Managing Liability Risks* - Private ITS developers have expressed the view that while motor vehicle drivers presently bear the burden of the cost of automobile accidents, ITS user services which begin to exercise more vehicle control may shift liability to developers and operators of these services. The perceived vulnerability to lawsuits has resulted in calls for techniques to manage liability risk in certain ITS deployments.

While the US DOT, ITS America, academic institutions, and many other members of the ITS community have made significant progress in identifying and researching nontechnical barriers to ITS development and operational testing, much remains to be done. Nontechnical considerations may eventually present more demanding challenges to sustained and widespread expansion of ITS user services. The very nature of ITS deployment presumes fundamental changes in the institutional aspects of how transportation business has been conducted for many years.

V. WORKING TOWARDS ITS DEPLOYMENT

There is a clear national interest in realizing the benefits of enhanced transportation management, traveler services, safety, productivity, and in establishing the U.S. ITS market early so as to gain a competitive global advantage for the domestic ITS industry. The NPP establishes a vision of what can be accomplished in ITS deployment for the near future and explores the implications of different public and private deployment roles. The following section summarizes the NPP recommendations for roles and activities for the private sector, state and local governments, the US DOT, and ITS America in support of the continuing deployment of ITS.

State and Local Government

The role of state and local governments is to determine the needs of their communities and to organize funding, develop, and execute those projects which address their transportation needs. In that sense, state and local governments will likely initiate ITS infrastructure related projects, which may also involve private sector and the federal government participation. It is essential that state/local governments become aware of how ITS can be used to address their transportation needs, and then make short and long-range plans for the deployment of ITS. State and local governments should be encouraged to work closely with the US DOT, the private sector, and ITS America to coordinate deployments and achieve national compatibility.

The Private Sector

The primary role of the private sector is to develop and commercialize ITS products and services for consumers, industry, and the public sector. To fulfill this role, the private sector will invest and engage in a variety of activities, including research and development, market studies, product testing, and system evaluations. The private sector actions will be based on feasibility, marketability, and levels of acceptable risk. The private sector may take risks in deploying ITS products in advance of a well established market.

Public sector confidence and commitment to deploying the basic infrastructure to support in-vehicle, traveler, and other end-user information products is vital in encouraging early private sector investment. The public sector role must be vigorous enough to stimulate private sector participation, but not so aggressive as to preempt private sector involvement. Close cooperation between the private and public sectors is indispensable for achieving this balance.

The US DOT

The role of the US DOT is to facilitate the deployment of ITS information and communications infrastructure and stimulate private sector involvement and investment. The US DOT may, for example, facilitate the development of the communications and information infrastructure needed to deliver many ITS services by facilitating public and private institutional relationships; or supporting the development and coordination of travel and transportation management data bases; and by helping to fund the design, development, and deployment of ITS. The US DOT should continue to invest in long-term research, such as automated highway systems.

The US DOTshould employ incentives rather than regulatory mandates to achieve their objectives. The role of the private sector as partners and as infrastructure providers should be further developed. Where appropriate, federal funds should be used to enhance the development and deployment of ITS infrastructure. The use of private funds should be cultivated, or perhaps required, as part of the Federal-aid matching funds.

ITS America Role

The ITS community recognizes that ITS will be most effectively developed and deployed through a partnership of the public, private and academic sectors. ITS America is the embodiment of this partnership. It has a vital role in establishing cooperative working relationships and in promoting a national ITS program.

ITS America brings new interests and constituencies into the ITS deployment process, expanding ITS involvement through technical committees and state chapters, disseminating information, and building international relationships. ITS America plays a major role in guiding and building consensus for the national ITS architecture and for coordinating the development of standards and protocols. It plays an important role in building support for and awareness of ITS through its outreach program. ITS America's involvement in consensus building has focused attention on technical and non-technical issues and in the promotion of intermodalism. ITS America is the vehicle through which the members of the ITS community can exchange ideas and concerns.

The recommendations and issues in the NPP are presented for consideration and further discussion by the ITS community. Strategies for deployment and effective involvement of the participants must be implemented. A consensus on how ITS deployment should proceed will speed the realization of the benefits offered by ITS to travelers and transportation users.

ACKNOWLEDGEMENTS

A substantial number of individuals contributed this document. The members of the ITS America Planning Committee, participating US DOT officials, and the Joint Writing team are listed with their affiliations below. The names and organizations of over 200 individuals who reviewed and commented on one or more drafts of the Plan are listed in Appendix A.

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APPENDIX D

ITS America, *Dedicated Short Range Communications Standards Update* (Oct. 3, 1996)

Dedicated Short Range Communications

Standards Update

October 3, 1996

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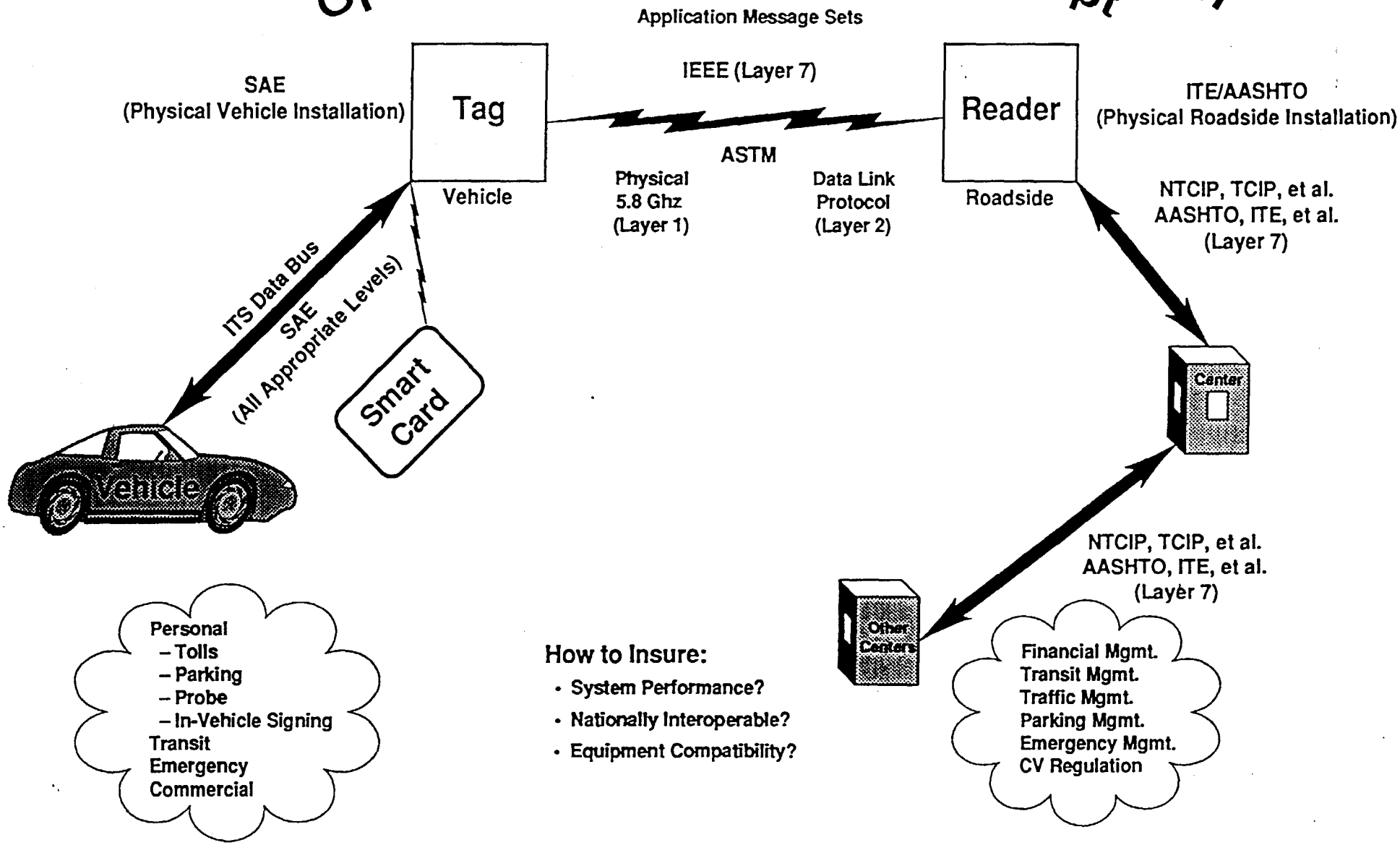
D S R C

Interoperable Operational

Multi-Application Concept



Board Priority	Standards Needs	Lead SDO	Supporting SDO(s)	Status
Very High *Initiate standards development in 1 year*	DSRC Protocol *Protocol for short-range wireless ITS communications between the vehicle and roadside services.*	ASTM	AASHTO/IEEE/SAE	Funds to be released 10-07-96. Draft standards due 12-96.
	Location Reference Specification *Defines the general mechanism for specifying a geographic location.*	SAE	AASHTO/ITE	Draft standard due 09-97.
	MS for Controlling Field Equipment (NTCIP) *Prescribes the form and content of the messages exchanged between a TMC and roadside field equipment (e.g., traffic signals, VMSs) to control and monitor such equipment.*	AASHTO	ITE/SAE/NEMA	Funded. Draft specification due 2nd and 3rd quarters 1997.
	MS for ETC and CVO DSRC *Prescribes the form and content of the messages exchanged between a toll collection authority and a vehicle from which a toll is to be electronically collected.*	IEEE	SAE/AASHTO	Draft standard available late 1997.
	MS for Incident Management *Prescribes the form and content of the messages for real-time emergency notification from the Emergency Management Subsystem to other centers and providers.*	IEEE	AASHTO/ITE	Plan will be submitted soon.
	MS Template *Provides an overall syntax and structure for ITS Message Sets, in part to provide a mechanism for unambiguously establishing to which message set a particular message belongs.*	IEEE	ITE/SAE	Draft standard due 03-97.
	National Trans Comm ITS Protocol (NTCIP) *Protocol for wireline communications between traffic management centers and field equipment. Potential expansion to communications among TMCs and between TMCs and other centers and providers.*	AASHTO	ITE/SAE/NEMA	Ballots accomplished by NEMA on 1st parts of standard. AASHTO and ITE parts due by end 96.

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Very High	Traffic Controller 2070 (NTCIP) *Standard for advanced traffic field equipment controller.*	ITE	AASHTO	Control device standard due 2nd quarter 97. Field cabinet enclosure specification due 3rd quarter 97.
Initiate standards development in 1 year	Traffic Management DD *Defines the logical and physical characteristics of data elements and messages used in traffic management applications.*	ITE	AASHTO	Provisional standard available 11-96. Formal standard in 01-98.
	Traveler Information DD & MS *Defines the logical and physical characteristics of data elements and messages used in traveler information applications.*	SAE	AASHTO/IEEE	Draft partial standard due 03-97.
	Umbrella Standard for ITS DD *Overall structure and characteristics for ITS subject area data dictionaries.*	IEEE	ITE/SAE	Drafted standard due 03-97.

Heavy box is primary standard
Double Line box is supporting standard

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High *Initiate standards development within 3 years*	ASN.1 [ISO 8824] Application to ITS *Application of ASN.1-specific techniques to ITS, including standardization practices and applications.*	SAE	IEEE	
	Communications survey of stds. & practices	IEEE	SAE	Plan under review
	CV Operations DD *Defines the logical and physical characteristics of data elements and messages used in commercial vehicle operations applications.*	DISA X12	IEEE/SAE	Funded under separate effort
	High Speed Data Subcarrier Protocol *Protocol for high speed wide area FM subcarrier data broadcast.*	NRSC	SAE	Funded
	In-Vehicle Databus Interface *Standard physical and data interface between ITS devices and the in-vehicle databus.*	SAE		Funded
	ITS Map Datum *Specifies a standard collection of geodetic reference points for use in conjunction with the Location Reference Specification.*	SAE		Funded through ORNL
	MS for Automatic Vehicle Identification *Prescribes the form and content of the messages exchanged between a vehicle and a center/service provider to determine the identity of the vehicle. An enabler for applications (like ETC) which need to identify vehicles.*	IEEE	ASTM/SAE	Plan due soon
	MS for Automatic Vehicle Location *Prescribes the form and content of the messages exchanged between a vehicle and a center/service provider to determine the location of the vehicle.*	IEEE	SAE	Medium priority for DOT funding. Planned for FY97.

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High *Initiate standards development within 3 years*	MS for CV Accident Reporting *Prescribes the form and content of the messages sent from accident investigation authorities to accident record keeping agencies.*	?	IEEE/SAE	Separate project
	MS for CV Credentials *Prescribes the form and content of the messages exchanged between CV operators and regulatory agencies to apply for and receive credentials.*	DISA X12	SAE	Separate project
	MS for CV International Border Crossing *Prescribes the form and content of the messages exchanged between CV operators and international border agencies regarding cargo and custom duties required to clear a CV at international borders.*	DISA X12	SAE	Separate project
	MS for CV Safety & Credentials Information *Prescribes the form and content of the messages exchanged between CV operators and regulatory agencies to secure summaries of CV safety and credentials data.*	DISA X12	IEEE/SAE	Separate project
	MS for External TMC Communication *Prescribes the form and content of the messages exchanged between TMCs and other (non-TMC) centers and/or service providers.*	ITE/AASHTO		First message set plan for completion by 06-97.
	MS for HazMat Management *Prescribes the form and content of the messages between TMCs and Fleet/Freight Managers to authorize and monitor the movement of Hazardous Material.*	?	IEEE/SAE	
	MS for Mayday Alert *Prescribes the form and content of the messages exchanged between an ISP and in-vehicle system which provides notification of a situation requiring various levels of aid or assistance.*	SAE	AASHTO	Funded

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High	MS for Public Transit Electronic Fare Coll *Prescribes the form and content of the messages exchanged between a passenger's electronic fare paying device and the electronic fare collection device on the Public Transit vehicle.*	IEEE	SAE	
Initiate standards development within 3 years	MS for Public Transit Emergency Services *Prescribes the form and content of the messages exchanged between the Transit Management Center (TRMC) and an Emergency Response Management Center (EMC).*	SAE	SAE*	
	MS for Public Transit Information Services *Prescribes the form and content of the messages exchanged between the Transit Management Center and the Passenger, possibly via an ISP, to provide information on the status of the system for pre-trip and enroute information and planning.*	ITE	IEEE/SAE	
	MS for Public Transit Operations Mgmt. *Prescribes the form and content of the messages exchanged between transit vehicles and the transit management center (TRMC).*	ITE	IEEE/SAE	TCIP plan under review.
	MS for TMC Intercommunication (NTCIP) *Prescribes the form and content of the messages exchanged between cooperating TMCs.*	AASHTO	ITE/NEMA	Funded
	MS for Traffic Signal Priority (NTCIP) *Prescribes the form and content of the messages exchanged between a TMC and (1) an emergency services vehicle or (2) a public transit vehicle which requests a temporary adjustment in the control of roadside field equipment (e.g., traffic signals, VMSs) to provide priority to the requesting vehicle. [The EMC or TRMC might make the request on behalf of a vehicle it is managing.]*		ITE/SAE	Funded

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High	MS for Vehicle Nav (1) Outbound *Prescribes the form and content of the messages sent by a TMC or ISP to the entire vehicle population within the coverage area describing the state of the roadway network.*	SAE	ITE	Funded
Initiate standards development within 3 years	Public Transit Data Dictionary & MS *Defines the logical and physical characteristics of data elements and messages used in public transit applications.*	ITE	SAE	
	Radio Broadcast Data System Protocol (LS) *Protocol for low speed (less than 1kbps) wide area FM subcarrier data broadcast.*	NRSC	SAE	
	Spatial Data Interchange *Defines the mechanism for the exchange of spatial information among multiple dissimilar sources or users.*		IEEE/SAE*	Separate ORNL project

*** = If Not Lead**

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Moderate	Independent Testing Institute *Independent Testing Institute for Validation of Map Database Vendor Representatives Under SAE J1663*	SAE	ASTM	
Initiate standards development within 5 years	Intelligent Cruise Control Guidelines *Guidelines to promote the standardization of driver interactions in programming Intelligent Cruise Control systems (i.e., setting desired operational parameters).*	SAE		
	Map Database Truth in Labeling *Extension of the current Map Database Truth in Labeling Standards (SAE J1663), to incorporate characteristics of interest to navigation for commercial vehicle operations, public transit, etc. (The current version of J1663 is focused exclusively on characteristics related to passenger vehicle navigation).*	SAE		
	MS for CV Citations *Prescribes the form and content of the messages exchanged between CV operators and regulatory agencies regarding infractions of safety or operating regulations.*	?	SAE	Separate effort
	MS for CV Compliance Review Reporting *Prescribes the form and content of the messages sent by inspectors to regulatory agencies to transmit reports that result from reviews and inspections of CV carriers and vehicles.*	?	SAE	Separate effort
	MS for Parking Management *Prescribes the form and content of the messages exchanged among vehicles, parking operators, information service providers, and financial institutions to facilitate the location of parking spaces and handling of parking fees.*	IEEE	SAE/ITE/AASHTO	

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Moderate	MS for Vehicle Navigation (2) Interact. RG *Prescribes the form and content of the messages exchanged between an in-vehicle navigation system and an ISP, where the ISP accepts and processes requests from the vehicle for a centrally calculated point-to-point route.*	SAE	ASTM	Planned for FY97 funding.
Initiate standards development within 5 years	Vehicle Nav/Route Guidance Guidelines *Guidelines to promote standardized driver interfaces promoting increased safety for operators.*	SAE		Revised plan under review.